



**Kansas City Plant**  
National Secure  
Manufacturing Center

# *National Secure Manufacturing Center*

## **Reverse Engineering**

**Garry Ahlgren**  
Team Leader



*We make products for national security.*

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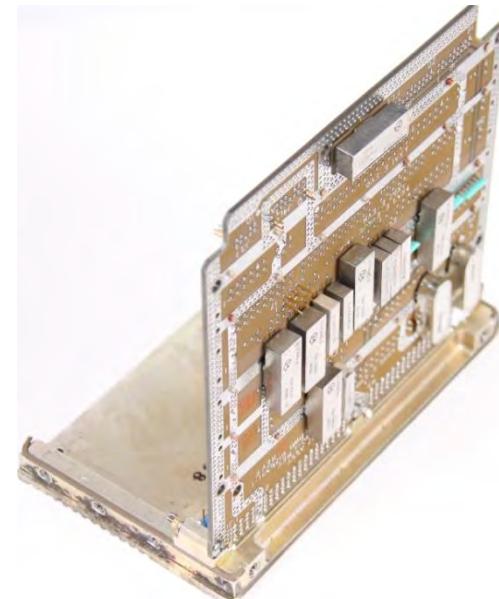
# Reverse Engineering Missions

Reverse engineering and manufacturing:

- Electro-mechanical assemblies/subassemblies
- Electronic circuit board assemblies

Product verification to original design:

- Has the assembly been changed?
- Does the assembly meet specification?
- Similar process to Counterfeit part detection



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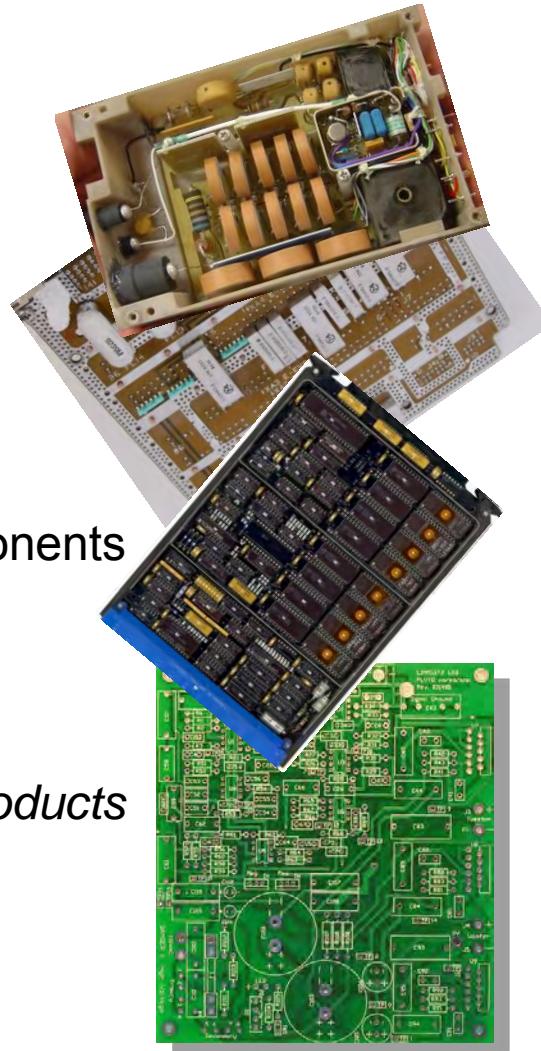
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# Wide Spectrum of Products

Electro-mechanical assemblies – motors, etc.

Printed circuit board based electronic assemblies

- Old, obsolete “legacy” type assemblies
- Large, multilayer circuit boards
- Miniature circuit boards
- Latest technology – fine pitch, embedded components



*Extensive experience delivering reverse engineered products*

*We make products for national security.*



# Reverse Engineering Processes

## Define Performance / specification

- Test/Analyze assembly
- Inspect
- Quantify performance
- Develop specification

## Disassemble

- Document & catalog parts
- Recover embedded software





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# Reverse Engineering Processes

Develop design definition package

Reverse engineer printed circuit board

Reverse Engineer schematic

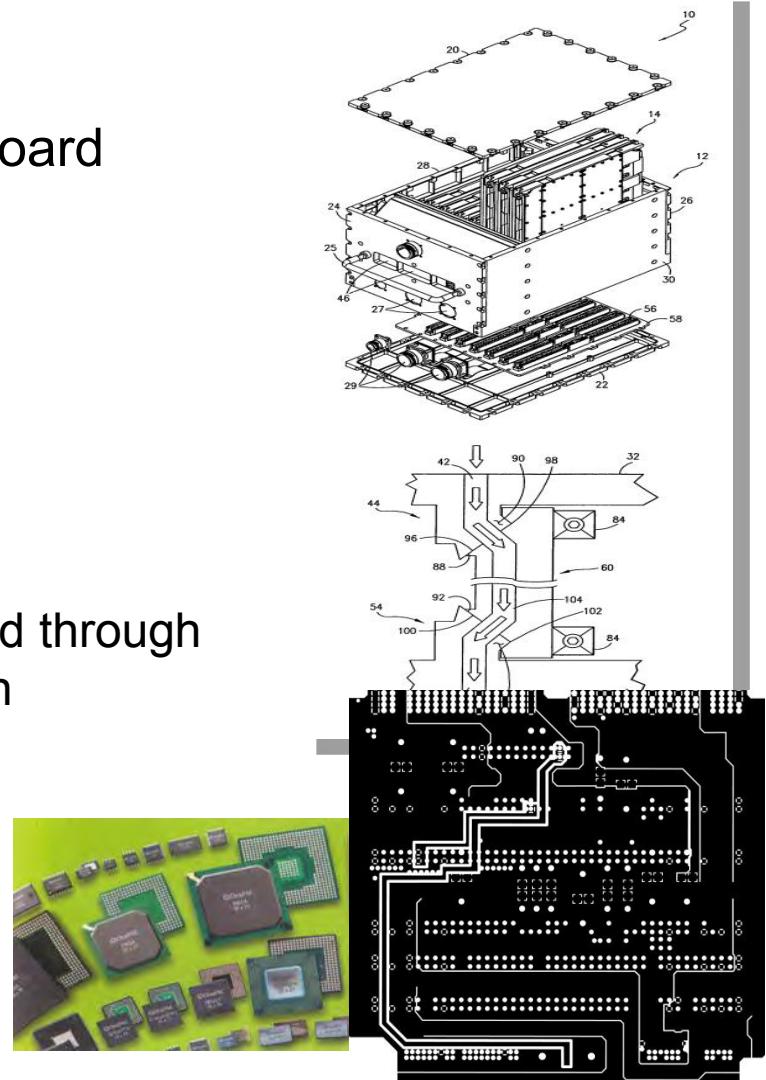
Identify components

Some parts may be unmarked

Some parts may be obsolete

Suitable replacement parts identified through  
analysis and functional evaluation

Some parts very small





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# Circuit Board Reverse Engineering Process

Capture circuit board design

- Image board surfaces

- Synthesize electrical properties from images

- Remove surface layers and repeat imaging

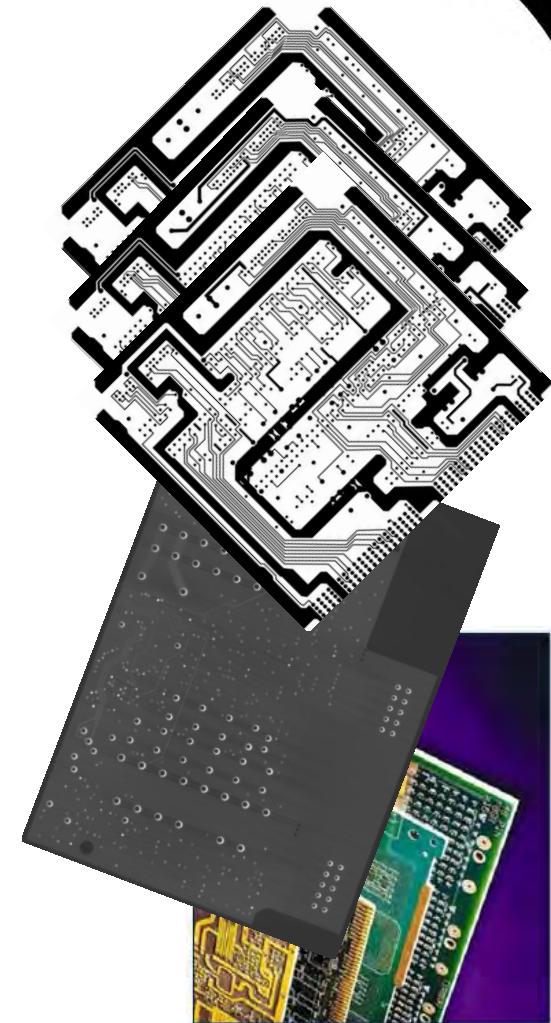
- Integrate layers to create CAD definition

Verify design to original definition

- Test CAD definition files

Analyze board material

Manufacture boards to exact original definition



***Capability based on internally developed custom processes and  
broad NSMC technologies***

# Reverse Engineering Processes

## Analyze design

Supercomputer modeling & simulation

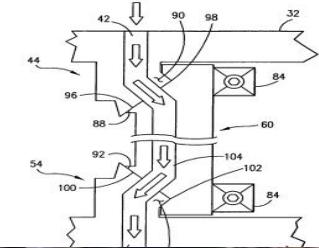
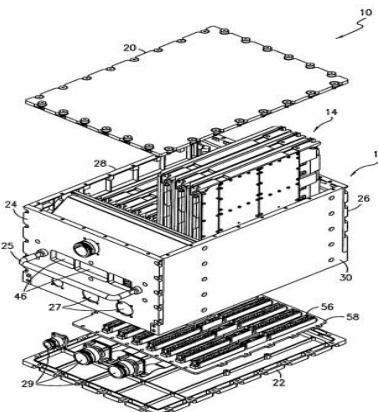
Determine design margin

Analyze legacy failure data

Partner with customer for product improvement

Finalize spec

## Build production quantities



# Reverse Engineering Production

Automated assembly

Experienced production team

Extensive inspection and rework capability

X-ray solder inspection station

BGA removal/replacement station

Automated board test

Microcircuit production

Secure facility -classified production

***Complete Reverse Engineering and Production under one roof***

# Reverse Engineering Challenges

High complexity

Large number of Vias & Nets

Very fine geometry / thin layers

Multiple *Identical* copies of target

Target assembly doesn't match documentation

***Complete Reverse Engineering and Production under one roof***

# NSMC Reverse Engineering

Experienced Reverse Engineering Team

Capabilities developed from many complex assemblies

Broad Spectrum of supporting technologies

Analytic (CSI) lab

Computer simulation

Extensive environmental / performance envelop testing

National security asset

Secure manufacturing environment

Contact

Garry Ahlgren

National Secure Manufacturing Center  
816 997 4508